Appendix B: Workshop Minutes

South Coast Missing Linkages Workshop
September 30, 2002 at the Frazier Park Recreation Building

8:00 Check-in

8:30 *Welcome and Opening Remarks*
Rick Rayburn, California State Parks

8:40 *Regional Overview*
Paul Beier, Northern Arizona University

9:00 *Linkages From a Plant Perspective*
Ileene Anderson, California Native Plant Society

9:20 *Connecting Arthropods in the Southern Sierra Nevada Area*
Gordon Pratt, University of Riverside California

9:45 *Herpetofaunal Biodiversity in the Southeastern Sierra Nevada Mountains*
Dave Morafka, California State University, Dominguez Hills

10:15 Break

10:30 *Hop, Crawl or Slither? Contrasting Corridors for Herpetofauna*
Rob Lovich, AC/S Environmental Security Marine Corps Base, Camp Pendleton

10:50 *Birds Can Fly: An Overview of the Conservation Challenges in the Southern San Joaquin Valley*
David Clendenen, Preserve Manager for The Wildlands Conservancy at Wind Wolves Preserve

11:10 *Blue Grouse, Exit Stage Right*
James Bland, Santa Monica College

11:30 *Considering Small Mammals in Linkage Planning for the South Coast Ecoregion*
Wayne Spencer, Conservation Biology Institute

11:50 *Cougars, Corridors, and Conservation*
Paul Beier, Northern Arizona University

12:10 *Considerations for Connectivity and Overview of Working Group Session*
Claudia Luke, San Diego State University Field Station Programs

12:30 Lunch - a Mediterranean mezza will be served

1:15 Working Group Session

Taxonomic Group Leaders:

Plants	-	Tim Thomas
Invertebrates	-	Gordon Pratt
Herps/Fish	-	Claudia Luke
Birds	-	Michael White
Mammals	-	Paul Beier

4:45 *Closing Remarks*
Kristeen Penrod, South Coast Wildlands Project

5:00 Adjourn: Please join us for a Beer & Wine Social here at the Frazier Park Recreation Building.

South Coast Missing Linkages Workshop Minutes
September 30, 2002 at the Frazier Park Recreation Building

Rick Rayburn, California State Parks – *Welcome*

Biography: Mr. Rayburn has been Chief of the Natural Resources Division at California State Parks since 1986. In this capacity, his responsibilities over natural resource management for the State Park System have included classification of state park units, resource elements of park general plans, stewardship funding programs, policy formulation and natural resource acquisitions. Prior to this position, he spent eight years as the Regional Director for the North Coast (San Francisco to Oregon) California Coastal Commission. Primary responsibilities included land use planning and regulatory oversight for coastal conservation and development. Mr. Rayburn attended UCLA and Humboldt State University, majoring in management and forest ecology.

- Speaker participates in acquisition planning for State Parks, Wildlife Conservation Board, and California Department of Fish & Game; South Coast Missing Linkages Project is crucial to this (most important acquisition planning effort going on in the state)
- Many biological reports discuss habitat fragmentation and conversion, and the need to establish linkages to maintain biodiversity, but recommendations are lacking in how to overcome obstacles and actually plan for connectivity
- For major land managing agencies in California (including the military), land acquiring agencies, and nonprofit organizations, fragmentation is a difficult issue to address
- Most linkages involve lands connecting areas that have already been preserved due to on-site habitat values; there is less enthusiasm to protect connective habitats as they may seem less desirable based on habitat characteristics – but these areas are essential to preserve existing regional biodiversity, and should no longer "fall between the cracks"; it is time for land acquisition agencies to start addressing this issue
- Coal Canyon was recently preserved (and will soon be restored) to re-establish a connection between Santa Ana Mountains and Puente Whittier Hills
- Connections necessary to protect previous investments in preserved areas
- Acquisition planning is limited throughout the state; usually driven by opportunity purchases, lacking thorough assessment; this project will establish locations of important habitat connectors (linkages) based on biological needs of focal species and practical design, not just according to cost and opportunity
- Next round of workshops will involve land planners and agents for conservation design
- California State Parks' top acquisition program objective for natural resources is maintenance of landscape linkages, which will support quality of already protected lands; this timely effort will identify key areas for land purchases and conservation easements

- This project will also help agencies enforce laws to avoid subdivision and land conversion in priority connectivity areas to allow wildlife movement
- Thank you to David Myers of The Wildlands Conservancy (for supporting this project and protecting the Wind Wolves Preserve), Kristeen Penrod, and SCWP board members
- September 2002 Discover Magazine article highlighted and publicized this effort

Paul Beier, Northern Arizona University – *Regional Overview*

- Speaker presented virtual tour with photographs and maps of the three linkage planning areas; illustration and overview of major existing impediments to connectivity (SR-14, I-5, SR-58, SR-138, industrial and residential developments, and California aqueduct)
- San Gabriel - Sierra Madre Mountains: this linkage is seriously threatened and needs swift action to maintain a connection; no continuous natural routes exist across SR-14 (100 to 300-foot filled slopes with no bridges); break is 4-7 miles wide between Angeles National Forest protected lands; two potential corridors for terrestrial wildlife discussed:
    - Route through Soledad, Bee, Spring (quiet underpass), Agua Dulce (busy underpass) and Tick Canyons; about ¼ mile wide at narrowest area; will be challenging for animals to move through corridor while avoiding developed areas
    - Ritter Ranch route crosses SR-14 at major highway interchange that will be difficult to span, with railroad tracks, access roads, parking areas, and trenches
- Eastern - Western Sierra Madre Mountains: crossing I-5 between Angeles and Los Padres National Forests is main concern; no bridged streams; filled slopes along I-5; only large vehicle underpass is on private property (Canton Canyon); second vehicle underpass is large box culvert (gravel dispenser); third possible option is bridge or over-pass at Cherry Canyon (lots of deer here); these routes connect to Piru Creek
- Sierra Madre - Tehachapi - Sierra Nevada Mountains: million-acre core habitat area
    - I-5, SR-138 and aqueduct are barriers in southern area; six small box culverts present; triangle of land at quiet, well-bridged highway interchange is undeveloped and prime candidate for connectivity between Angeles National Forest, Tehachapi foothills and Hungry Valley SVRA – also includes Gorman Creek riparian area; fenced aqueduct and overflow canal are serious barriers
    - SR-58 is movement barrier for terrestrial wildlife in central linkage area; 3 quiet vehicle underpasses present; 5-foot-high concrete divider down center of highway; heavy traffic; some bridges and one paved overpass exist near Tehachapi, where much natural habitat (oak woodlands) remain; BLM ownerships are located east of Tehachapi near three good underpasses (Cache Creek, Sand Creek Rd, railroad) and one overpass (Cameron Rd, where Pacific Crest National Scenic Trail crosses); potential corridor leads through windfarms

Ileene Anderson, California Native Plant Society – *Linkages from a Plant Perspective*

Summary: The workshop's geographic area is rich in diversity of plant species / associations due to the convergence of a variety of physiographic features. Thoughtful evaluation of species / associations' basic ecological requirements is required to retain ecological functioning that enables plant persistence over time. The diversity of plant associations numbers well into the hundreds (with some not currently identified) due to the unique geographic location of the workshop planning area. It also includes the San Andreas Rift Zone. The ecotonal nature of the area is another important component to consider when

appraising linkages. Focus on indispensable mutualisms, dispersal mechanisms, great regional diversity of species, and rare plant issues should help to frame the vegetation theme, and provide context for the afternoon breakout session. Some considerations involved in assessing viable habitat corridors regarding plants are that abiotic and biotic pollen and propagule dispersal needs for plants are essential functions that linkages provide. Pollination of flowering plants in fragmented landscapes is significantly increased by corridors, and highly correlated to the size / number of those corridors (Townsend and Levey 2002). Different dispersal strategies are used by different plant species, and all must be considered when linkages are identified. Dispersal opportunity is a factor in determining species richness in successional stands of vegetation (Matlack 1994). Linkages must provide opportunities for plant movement across the landscape over the long-term. On the geologic timescale, plants move in elevation and latitude to exploit changes in climatic conditions – historically from glacial / interglacial periods, but contemporarily from human-caused changes (global warming). Rare plants are often associated with unique substrates. Linkages promote an increased chance of persistence in rare plants that utilize these naturally occurring fragmented habitats through propagule dispersal (Kirchner et al. 2002).

Biography: Ileene Anderson works as the southern California regional botanist for the non-profit California Native Plant Society. She received her Masters degree at California State University, Northridge for her work on the systematics of shrubby *Atriplex.* Prior to her focus on southern California, Ileene consulted on projects throughout the southwest. Her current interests include sensitive species distributions, impact evaluations to sensitive botanical resources, and restoration.

- There are many ways in which linkages favor long-term plant persistence
- Linkages are essential for pollination; wind and water transfer pollen between populations for some species, but wildlife movement is needed for pollination of many plants; linkages reduce effects of fragmentation; recent studies have shown benefits of corridors for plants (particularly through insect pollination)
- Dispersal of seeds, other plant materials, and spores is also linkage issue, accomplished by wind, water, erosion of unstable soils, and critters (including insects) that cache seeds, ingest them, and otherwise move them around
- Rare plant studies show that substrate-specific species live in naturally fragmented landscapes; linkages between such sites are important for seed dispersal and pollination
- Disturbance regimes (fire, flood): if vegetation is wiped out and propagules destroyed, linkages are essential to allow return of native plant material to site
- Geologic timescale: plants move around over time; connectivity is important for long-term persistence of vegetation communities; plants need linkages to move around as they have historically to disperse across the landscape in response to global changes; must consider elevational and latitudinal linkages
- Study area includes Transverse Ranges, Great Valley, Tehachapi Mountains, and Southern Sierra Nevada Mountains, and is a meeting area for multiple ecoregions / ecotones leading to great botanical diversity; plant species of Carrizo Plains were evolutionarily connected to western deserts (consider long-term geologic timescales)
- CNPS manual of California vegetation identifies plant communities at lower level as series, alliance, or association; overlapping habitats result in hundreds of such series in the linkage planning area (and many have not yet been identified due to limited access); some Pleistocene relicts include great basin sagebrush and blackbrush scrub, which need connectivity to remain viable into the future

- Photographs shown: great basin sagebrush, California juniper association (threatened by increasing human activity and fire occurrence), San Gabriel Mountains, desert scrub, Joshua tree woodland (not adapted to fire - causes type conversion to desert scrub)
- In southern Sierra Mountains, hydrology and soils dictate naturally occurring fragments of mountain meadows in pinyon forest; alluvial processes provide opportunity for movement of plant propagules
- Botanically exciting area with localized populations of possible undescribed species (such as new onion found on pebble-based soils with no exotic weed competition); substrate-specific rare plants present
- Linkages encouraging plant movement may also allow spread of exotic weeds; corridors with disturbed habitats may allow invasive plants to exploit resources
- Some plant communities require fire for persistence (such as chaparral); desert plants not adapted to fire, and may type convert to support invasive species
- In San Gabriel Mountains and Great Valley, nitrogen deposition from poor air quality may effect vegetation by supporting exotic species over native vegetation

Gordon Pratt, University of California, Riverside - *Connecting Arthropods in the Southern Sierra Nevada Area*

Summary: Terrestrial arthropods, 95% of which are insects, play a large and important role in the health of the environment. Practically everything depends on them: they do most of the pollination of flowering plants, most of the recycling of dead plants and animals, and are the major food resources for insectivorous fish, birds, lizards, and mammals. By encouraging insects into the corridors, birds, lizards, and mammals will also be more likely to use them. Dispersal is extremely variable throughout the different groups, with even different life history stages exhibiting different types of dispersal abilities. The dispersal capabilities of over half of the many nocturnal species are unclear at this time. The insects most affected by corridors between mountain ranges are those adapted to the lower elevations of the mountains being connected. Most endemic species that are restricted to higher elevations have small ranges and poor dispersal capabilities. Although lower elevation species often have wide ranges, isolation of populations would allow large area extirpations through events such as wildfires, droughts, etc. and in time multiple events could cause their extinction. These species with wide ranges may also depend on much larger gene pools than locally restricted endemic species. Some experts believe this sort of isolation between populations may have caused the endangered status of the quino checkerspot in southern California. At least one rare butterfly, the San Emigdio Blue, is found to be interconnected only in this region (southwestern Inyo, San Luis Obispo, northwestern Los Angeles, Kern, Ventura, and possibly northeastern Santa Barbara Counties). This blue is not only restricted in distribution but, because of its uniqueness, has been placed in its own genus.

Biography: Pratt began his academic career with a bachelor's of science in biology at Northeastern University in Boston, Massachusetts. He finished a master's degree in Molecular Biology isolating and identifying mRNAs for specific proteins of the blowfly at Queen's University in Kingston, Ontario Canada. Pratt then did a Ph.D. on the evolution of the *Euphilotes enoptes* and the *E. battoides* complexes (small blue butterflies adapted to buckwheats) at the University of California at Riverside, California. Afterwards he did a post-doctorate on the sympatric evolution of treehoppers at the University of Delaware. Presently Pratt is a researcher at the University of California at Riverside working on endangered butterflies and the diversity of insects in various desert areas. He co-

teaches a course on the ecology of butterflies of southern California through extension at UCR. Pratt has authored and coauthored 36 papers on insects, most of which are on different aspects of butterfly evolution and biology.

- Development has created major dispersal problems in southern California for crawling and flying insects
- Illinois study showed that roads in the state were responsible for an estimated 20 million butterflies and moths killed per week; if roads create such a movement barrier for flying species, must be very difficult for terrestrial invertebrates, such as tarantulas, to cross
- Arthropods exhibit wide variety of dispersal capacities: crawling, flying, hopping; maybe 75% insects are nocturnally active; seasonal differences in movement; differences between sexes (for example, only male velvet ants are winged)
- Butterflies may follow ridges and hilltops; life stage differences (Quino checkerspot butterfly larvae actually disperse a bit by grazing and searching for food plant)
- Insect world is the center of everything: estimated 10 arthropod species exist for every plant species; insects are food sources for wildlife (especially birds, frogs and lizards)
- Introduced non-native insect species include Argentine ants, which displace native ants to the detriment of horned lizards
- Insects recycle nutrients (feces, dead animals) and pollinate plants (proboscis length and shape for butterflies correspond to certain plant species for nectaring)
- Only 12 known populations exist of San Emigdio blue butterfly with type locality at Wind Wolves Preserve; larvae specific to *Atriplex canescens* (but also use *A. lentiformis* and *A. polycarpa*); ants protect larvae against predators and parasites, getting nutritive rewards from scales in exchange
- Insect dispersal issues seen with Quino checkerspot butterfly, which flies 2-4 feet above ground when dispersing, and prefers bright sunny areas devoid of vegetation; attracted to roads as open barren dispersal habitat; probably will not utilize underpasses
- Must identify all host plants for herbivorous feeding by focal species to plan for linkages; butterfly biology is related to blooming periods
- Possible focal species for this region: *Hesperia columbia* (rare butterfly that prefers hilltops to search for mates); California dogface (state butterfly that feeds exclusively on *Amorpha* spp.); Coronis fritillary (could be used to monitor dispersal); Lorquin's Admiral (larvae feed on willows; females oviposit on leaf tips that can be identified in field surveys); many additional regional butterflies mentioned with various host plants

Dave Morafka, California State University, Dominguez Hills – *Herpetofaunal Biodiversity in the Southeastern Sierra Nevada Mountains*

Summary: This brief overview will address the surprising diversity of herpetofauna in the southeastern Sierra Nevada Mountains, and the proximate 'sky island' ranges circumscribed by the Pleistocene Owens River drainage. These sky islands herpetofauna are sometimes distinguished by a "deep" rather than a "shallow" paleoecological history. Examples include the undescribed bolitoglossine salamanders of the genera *Hydromantes*, as well as the described taxon, *Batrachoseps campi*. Toads of the *Bufo boreas* complex include two regional endemics, *B. canorus, B. exsul,* and just peripherally, *B. nelsoni*. The distinctiveness of two snakes further supports this pattern: the blackhead snake, *Tantilla hobartsmith,* and the endemic putative "subspecies", the Panamint rattlesnake, *Crotalus mitchelli stephensi* - so do newly described members of the *Eumeces skiltonianus-gilberti* complex. The status of the endemic alligator lizard, *Elgaria panamintina* will also be reviewed. Both historical contingency and favorable contemporary topography play a role in

sustaining this remarkable herpetofauna, one which is far more regionally differentiated and richer in local endemics than its better known counterpart, the herpetofauna of the 'sky islands' of southeastern Arizona and southwestern New Mexico. The latter, while very rich in terms of alpha diversity, are the products of "shallow" history, and are almost entirely derived from a more robust assemblage of conspecific taxa in the adjacent Sierra Madre Occidental. A summary will be provided of historical and ecological factors, especially wetlands (in the broadest sense) which contribute to the differentiation and diversity of this herpetofauna. A first assessment will be offered of the current vulnerability of key / critical habitats. Recommendations will be submitted for identifying riparian habitats which might serve as corridors for particular amphibian and reptile taxa endemic to these ranges.

Biography: Dr. David Morafka is a Ph.D., Emeritus, Lyle E. Gibson Distinguished Professor of Biology at California State University, Dominguez Hills where, from 1972 to date, he has been teaching environmental biology, general zoology, paleontology, evolution, and herpetology. Dr. Morafka received his BS in Zoology with honors from the University of California at Berkeley in 1967, and completed the R.C. Stebbins supervised honor thesis on the microhabitats of the night lizard, *Xantusia vigilis* at Pinnacle, NM. David then earned his Ph.D. in Biology under Jay M. Savage (*A biogeographical analysis of the Chihuahuan Desert through its herpetofauna*). Research publications include one book, several chapters in symposium, and several dozen referred journal publications. Research interests include: neonatology of reptiles, especially the desert tortoise; desert biogeography, especially the differentiation and definition of North American deserts, the Chihuahuan Desert and 'sky islands of the northern Mojave - Great Basin interfaces in Inyo, Mono, and San Bernardino counties. Special focus is on the Panamint alligator lizard and Panamint rattlesnake, and the biogeography and systematics of fringe-toed lizards. David Morafka has earned external funding from the U.S. Army to study desert tortoise neonatology, along with efficacy of hatchery-nursery field stations at Ft. Irwin and Edwards Air Force Base. Scope of projects also includes: the conservation biology and auto-ecology of the Panamint alligator lizard, funded by the U.S. Army, USDA Forestry (Bishop), CDFG (Bishop) and USGS Species at Risk (SAR) program; Panamint rattlesnake ecology, genetics and systematics, funded by the U.S. Army; and the Mojave fringe-toed lizard conservation biology, ecology and genetics, funded by the U.S. Army and Anteon Corporation on behalf of the BLM.

- Ranges encapsulated by Pleistocene Owens River drainage constitute “the other sky islands” - apart from the well-known treasured montane relict and endemic communities in southeast Arizona and uplands of the arid southwest
- California sky islands located in northeastern part of linkage planning area; biogeographic context important for genetic and systematic views, and development of conservation argument; fossil and molecular evidence indicates salamanders may have been present since the Miocene; area of endemic and well-refined herpetofauna
- Region contains montane communities, springs and wetlands, and riparian corridors; riparian woodlands across valleys are extremely important as potential corridors connecting montane areas for some species; core montane areas determined, but peripheries vary through time depending on available moisture (in wet years, ranges may be interconnected directly or by riparian corridors, while isolated during dry years)
- Panamint alligator lizard typically found at 4,000-7,000 feet, but can range down to 2,500 feet, occasionally following riparian corridors down mountainside; many montane desert species follow wetlands to lower elevations, with connectivity potential during wet years
- Vegetation structure in arid climates alternates over time depending on rainfall
- Concentration of endemic herpetofauna found in desert mountain ranges

- Panamint canyons contain perennial snow-fed streams and waterfalls, chain ferns and orchids, and diverse riparian vegetation, although very close to Death Valley; endemic rattlesnake, slender salamander and alligator lizard found in Panamint sky islands
- There may be more undescribed salamanders in this region of California than in tropical Guatemala; one salamander species lives in ice-melt under rock crevices and dies of heatstroke at temperatures over 60 deg F; many unique endemic herpetofauna must be described to properly manage habitats in southern and central Sierra Nevada Mountains
- California's Sierra ranges are national hotspot of amphibian and reptile endemism; some species (such as western fence lizard) are ice age relics that occur in almost every range of the southwest U.S.; others are unique endemics not closely related to regional species, but morphologically similar to fossils from Mio-Pliocene and have existed on certain ranges for 5-10 million years or longer in relative isolation; Panamint alligator lizard is between these two extremes, with several partially differentiated populations

  Herpetofauna diversity based on:
  - Large size of ranges located in huge basins with available surface water
  - Old age of tectonic events forming these ranges (12-15 million years old)
  - Tremendous topographic relief and wide variety of habitats
  - Important wetlands between ranges with temporary connections during wet years
  - Insulation against change to some extent; "buffered bench" hypothesis says that ranges rise up like benches with steep ridge on one side and rolling plateaus on other side; snow-melt from high peaks feeds lower plateau streams to sustain surface water year-round at buffered latitude and altitude, conditions which can sustain populations in relatively mesic habitats for millions of years rather than thousands of years; creates treasure of relic herpetofauna in a "Miocene Park"

Rob Lovich, Camp Pendleton Marine Corps Base - *Hop, Crawl, or Slither? Contrasting Corridors for Herpetofauna*

Summary: The intersection of the Sierra Mountains, Coast, Transverse, and Peninsular Ranges is a dynamic contact zone for several biogeographic regions, and is home to a diverse array of amphibians and reptiles. Many of these species are uniquely adapted to particular habitats. In designing corridors to support natural movements for these species, consideration of different habitat requirements is essential. Ideally corridors should be designed to capture the full suite of environmental characteristics and allow for long-term maintenance of the rich biodiversity that characterizes the region. With respect to herpetofauna, natural barriers that preclude the movement of some species may represent corridors to other species. This presentation includes some examples of this, and contrasts some of the different habitat requirements of amphibian and reptile species found within the focal corridors. The importance of understanding differential habitat needs will provide information on how to address herpetofaunal habitat requirements in corridor design.

Biography: Robert is a herpetologist with academic degrees from the University of Hawaii at Manoa (B.S.), and Loma Linda University (M.S.). His research on the region's herpetofauna has focused primarily on their natural history and evolution. While his research is considered more of a hobby than a vocation, Robert has broad interests and is currently a wildlife biologist for Marine Corps Base Camp Pendleton in San Diego. When Robert is not working, he enjoys spending time with his wife and daughter, restoring his Pontiac GTO, and surfing.

- Multiple ecoregions (Northern Great Basin, Mojave, Sonoran, Peninsular, Transverse, Coast, Sierra, and Great Central Valley) converge within linkage planning area, resulting in high dynamic biodiversity for all taxa
- High level of endemism important for herpetofauna specific to certain substrates and microhabitats, so use of corridors in an area of such varied habitat types may take place over evolutionary time; some endemism is result of natural habitat barriers
- Potential corridors include riparian and aquatic habitats, valleys, and mountain ridges
- Corridor design based on habitat requirements for focal species (vegetation community, range in elevation, etc.); at preliminary linkage planning workshop, biologists identified spadefoot toad, arroyo toad, and western pond turtle as focal species, but these were all riparian species; species inhabiting other habitats and higher elevations were overlooked
- Red-legged frog inhabits coastal ranges and Caliente Creek in Tehachapi Mountains
- Extremely high level of endemism for slender salamander species found in planning area, but they are specific to microhabitats (thin riparian bands) and may not cross mountain ridges, valleys, deserts, etc.; ensantina complex found from Sierra Nevada through Tehachapi Mountains, but distributional gap occurs at San Gabriel Mountains
- Arroyo toad is federally endangered coastal drainage species; occurs in riparian areas, but streams and watersheds do not seem to match general linkage paths defined for focal species planning; planners can still attempt to conserve viable populations within corridors; not found in uplands, and moves linearly along streams through desert areas
- For linkage planning, try to encompass multiple microhabitats within corridors and populations of endemic or sensitive herpetofauna
- High-elevation mountain kingsnake and rubber boa are good species to represent use of corridors connecting montane habitats over ecological (not evolutionary) time frame; mountain kingsnake occurs on Alamo Mountain, Mount Pinos, and in Coastal, Transverse and Peninsular ranges, but not in Tehachapi Mountains; sometimes found at surprisingly low elevations and atypical habitats; genetic studies have shown distinctions between different mountain ranges, indicating little gene flow between populations historically
- Desert night lizard is abundant in Mojave Desert and may be good focal species
- Elevational profile of land acquisition may determine fate of some species
- Long-nosed leopard lizard found on desert slopes of San Gabriel Mountains and on Mojave Desert side of Tehachapi Mountains; federally endangered blunt-nosed leopard lizard found at lower slopes and canyon mouths of Tehachapi Mountains and coast ranges; the two leopard lizards infrequently interbreed in the Tehachapi area
- "Ring species concept" is a result of numerous molecular studies, and predicts that around a "ring" linking San Francisco Bay, northern California, southern Cascades, Sierra Mountains, and coast ranges, montane herpetofauna have been interbreeding over evolutionary time; great opportunity for conservation exists based on this concept; area is one of the most important biogeographic connections in the country

David Clendenen, The Wildlands Conservancy, Wind Wolves Preserve – *Birds Can Fly: An Overview of the Conservation Challenges in the Southern San Joaquin Valley*

Summary: On the face of it, birds … because they can fly, would seem to be less susceptible to the negative effects of habitat fragmentation than other more terrestrially bound vertebrates. In reality, as a group, birds display a high degree of variance with regard to their susceptibility to habitat fragmentation. Adaptable generalists such as the common raven are thriving in the southern San Joaquin Valley ecoregion. Specialists, such as the Yellow-

billed cuckoo and the southwest willow flycatcher are endangered. Other species, such as the purple martin and Lewis' woodpecker embody issues that go beyond habitat fragmentation. The Wildlands Conservancy's Wind Wolves Preserve and Stubblefield Ranch property, together with the Los Padres National Forest, the Bitter Creek National Wildlife Refuge, and the Carrizo Plain National Monument, create a vast block of connected habitats. However, great challenges remain. The San Joaquin Valley has largely been converted to monoculture farming. Recently proposed and expected future development projects on Tejon Ranch represent a tremendous threat to habitat connectivity. Aggressive and creative conservation action, combined with delicate politics will be required to maintain and re-create functioning habitat connectivity in the San Joaquin ecoregion.

Biography: David Clendenen has been Preserve Manager at The Wildlands Conservancy's Wind Wolves Preserve for the past five years. He worked for 15 years on the California Condor Recovery Program, as a biologist for the U.S. Fish and Wildlife Service, also serving on the Condor Recovery Team until 2001. David participated in reintroduction efforts for bald eagles and peregrine falcons following receipt of a BS degree in Wildlife Biology from Cal Poly State University, San Luis Obispo in 1981.

- San Joaquin Valley is highly altered ecosystem; habitat fragmentation, degradation, and loss is most severe on valley floor; 272,000-acre Tejon Ranch is currently proposed for development of 23,000-house Centennial community, a 1,450-acre warehouse complex, and ranchettes at Tejon Lake, creating an immediate threat to regional habitat continuity
- American crows and various blackbirds utilize crops, but use of pesticides impacts avian populations; it seems that crow and blackbird populations have dramatically declined
- Historic population trends for most birds in this region have not been documented
- Rim of valley floor has potential for maintaining connectivity; foothills on eastern side are relatively intact through Tehachapi and Sierra Nevada Mountains
- The Wildlands Conservancy has conserved nearly 100,000 acres, including Wind Wolves Preserve, near the Stubblefield property, Los Padres National Forest, Bitter Creek National Wildlife Refuge, and Carrizo Plain National Monument, which together create a vast, contiguous block of connected habitats
- Region is ecologically unique at convergence of Transverse Ranges, Coast Ranges, Sierra Nevada Mountains, western Mojave Desert, and San Joaquin Valley; elevation range of over 8,000 feet; impressive mosaic of habitats and biodiversity
- Diverse avifauna found here with variance in reaction to fragmentation; for example, common raven is flourishing to point that it negatively impacts other native species
- American kestrels found even near agriculture; white-tail kite is nomadic predator; turkey vultures capitalize on road kill, livestock mortality, and garbage; golden eagles found in foothills, and require undisturbed habitat (hazards posed by highways and power lines)
- Tricolor blackbird population is less than 200,000 and declining; nesting habitat in valley is mostly gone, and breeding attempts in agricultural fields often obliterated by harvest
- Captive breeding process and sub-optimal rearing and release methodologies have dramatically changed behavior of re-introduced California condors
- In general, sedentary habitat specialists are good focal species for linkage planning; participants should focus on habitat types to highlight species with special significance
- Grasslands, although altered by exotic annual grasses, should be preserved and managed to maintain biodiversity; they provide wintering habitat for long-billed curlew, mountain plover, and ferruginous hawk; possible focal species: ground nesting birds (horned larks, lark sparrows, and meadowlarks), savanna sparrow, burrowing owl
- Saltbush scrub focal species: sage sparrow, LeContes thrasher, and loggerhead shrike

- Riparian habitats need restoration (such as removal of salt cedar); possible focal species: willow flycatcher, least Bell's vireo, yellow warbler, and yellow-breasted chat
- Oak savanna requires conservation and management; must provide habitat for cavity nesters and excavators such as acorn woodpecker; also important are western bluebirds and purple martins; need to control European starlings and restore oak recruitment
- Montane areas are less threatened, except for fragmentation caused by logging in Sierra Nevada Mountains; obvious focal species for this habitat is the spotted owl

James Bland, Santa Monica College - *Blue Grouse, Exit Stage Right*

Summary: Blue Grouse are birds of the Boreal Forest. The Transverse Ranges of Southern California are the southwestern limit of the species' continental range. In the early 1900s, the Mount Pinos subspecies of Blue Grouse ranged from the Kings River Canyon, south and west across isolated mountaintops of Kern County, to the Mount Pinos area of Ventura County. The subspecies has apparently been declining since the 1940s. It was last documented in the Mount Pinos area in the late 1970s. The surveys I conducted last spring indicate the species' range has receded to the main Sierra Nevada ranges, near the Tulare-Kern County line. Although field studies have not been conducted to confirm the causes of this decline, habitat degradation is the most likely culprit. Biologists are only beginning to understand the unique habitat requirements of Blue Grouse in the Sierra Nevada Region. Having studied Blue Grouse throughout California over the past ten years, I have been able to piece together a tentative explanation for the disappearance of Blue Grouse from Southern California, one in which timber harvest, fire suppression, catastrophic fire, development, and the loss of habitat connectivity have degraded the habitat features that are essential to Blue Grouse.

Biography: James Bland is an Assistant Professor of Biology at Santa Monica College. He has a Master's Degree in Wildlife Ecology and is working on a PhD in Geography. His primary research interests are in forest ecology and gallinaceous birds, in the Sierra Nevada and in the Himalaya Mountains.

- Blue grouse inhabit coniferous forests of western North America; Mount Pinos blue grouse subspecies occurs at southwest limit of species distribution; most of planning area considered marginal habitat; limited scientific knowledge; recognized as gamebird
- Population declining since 1930s; 1928 Mount Pinos description estimated maximum of 50 pairs; 1978 was last documented sighting; no longer occur in Kern County; range contraction probably caused by habitat degradation related to logging industry
- Blue grouse more abundant in old growth forests; hooting males found in massive firs; habitat requirements in central Sierra Nevada Mountains have 3 seasonal components:
    - Spring courtship: males vocalize (hoot) to attract females in mixed mature conifer forests from 6,000-9,000 feet; require open glades with patchy mosaic of woody shrubs and herbs, and massive firs; usually group of about five males return to specific site until canopy closes over, which rarely happens in California
    - After hatching, females move chicks to summer brood-rearing habitat, a moist montane meadow with lush herbaceous growth in walking vicinity of hooting site
    - Over-wintering site (this site may be same as hooting habitat)
- More grouse found in protected mature forests (with firs over one meter in diameter and well over 100 years old) than in cleared or selectively harvested areas

- Fire suppression allows open glades needed for hooting to fill in with shrubs and young firs; also, catastrophic fires can kill the massive firs and also reduce grouse habitat
- Reforestation after clear-cut or burn: blue grouse need mixed conifers, but many areas have been planted as pine plantations / monocultures lacking firs and canopy openings
- Grazing livestock degrade soil, change hydrology, cause erosion, and trample herbaceous layer in brood-rearing habitat; blue grouse also impacted by encroachment of meadows for residential development and campgrounds, and ATV disturbance
- Linkages may restore blue grouse to southern California; protected mixed conifer "stepping stones" needed from Sierra Nevada Mountains into Tehachapi area, which has been used for timber production; protect mountain meadows; restore natural fire regime

Wayne Spencer, Conservation Biology Institute - *Considering Small Mammals in Linkage Planning for the South Coast Ecoregion*

Summary: For good reasons, linkage planning between major mountain ranges tends to focus on large, wide-ranging mammals. Smaller mammals should not be ignored in these efforts, however, because they can play numerous important roles in maintaining or monitoring linkage functionality. For example, small mammals are essential prey for larger carnivores within landscape linkages, may represent ecological "keystone species," and may be useful indicators for monitoring effects of fragmentation. Small mammals could be classified by their irreplaceability and vulnerability for assessing linkage function, by their major habitat associations or ecological functions, or by their dispersal tendencies. Although a few small mammals may use inter-montane linkages to disperse from one mountain range to another, those species living completely within linkages at lower elevations may be even more important for assessing inter-montane linkages. Linkage planning should therefore consider "orthogonal linkages," or those that follow elevational bands or drainages crossed by inter-montane linkages. Other general guidelines concerning small mammals in linkage planning include: (1) provide live-in habitat for prey species; (2) provide for natural processes like fire and erosional-depositional forces that replenish habitats; (3) provide for the full range of ecological gradients across the linkage, such as the full range of geologically sorted substrates in alluvial fans; (4) provide for upslope ecological migration in response to climate change; and (5) consider the limited dispersal tendencies of small mammals relative to dispersal barriers, such as roads and canals, and avoid creating death traps for them when designing crossings for larger species. Linkage planning should also consider ways to provide niches for habitat specialists, such as creating bat roosts in bridges or overpasses designed to accommodate wildlife movement.

Biography: Dr. Spencer is a wildlife conservation biologist who specializes in applying sound ecological science to conservation planning efforts. He has conducted numerous field studies on sensitive wildlife species, with a primary focus on rare mammals of the western U.S. Dr. Spencer has studied martens, fishers, and other carnivores in forest and taiga ecosystems, as well as rare rodent species and communities in the southwestern U.S. In the South Coast Ecoregion he has served as principal investigator for research designed to help recover the critically endangered Pacific Pocket Mouse and has worked intensively on efforts to conserve endangered Stephens' Kangaroo Rats, among other species. Dr. Spencer is currently serving as Editor in Chief for a book on the mammals of San Diego County. He also serves as a scientific advisor on a variety of large-scale conservation planning efforts in California, including the San Diego MSCP and MHCP, and the eastern Merced County NCCP/HCP. He is increasingly being asked by state and federal wildlife

agencies to help facilitate scientific input in conservation planning efforts, and to help train others in science-based conservation planning.

- Large wide-ranging obligate carnivores (megafauna) are key for linkage planning, as they must move between large habitat areas to survive and reproduce
- Linkages should provide habitat for more dispersal limited, habitat specialized small mammals that are critical prey for carnivores, and use corridors over "evolutionary time"
- Some small mammals have disproportionate effects on regional ecology and are considered keystone species: burrowing rodents (pocket gophers and kangaroo rats) modify soil, impact plant distribution, and create habitat for other species
- Habitat specialists: pocket mouse subspecies are adapted to specific vegetation types and geological substrates; high degree of genetic differentiation for small mammals due to geographic isolation (micro-habitats, topographic relief, distance, vegetation, etc.)
- Conservation planning recognizes irreplaceability and vulnerability by incorporating and connecting habitat for rare endemic species with limited geographic ranges
- For most small mammals, individuals will not move through inter-montane linkages and across elevation gradients from one range to another, but rather will benefit from long-term genetic exchange and adaptation, and from living within preserved linkages
- Orthogonal linkage concept: for small mammals distributed in elevational bands in particular plant communities or soil strata, breadth of linkage is important; habitat may be located at right angle to linkage direction; connect both across and along linkages
- Important opportunity for low elevation, gently sloping valley floor connectivity through Wind Wolves Preserve and Tejon Ranch (for kit fox, kangaroo rat, pocket mouse, pocket gopher); ecological up-slope migration may be needed for future climate change
- Aqueduct is major barrier for terrestrial species movement; safe crossings needed
- Possible focal species should help secure connectivity for various parts of broad landscape linkages, representing multiple habitats and mountain ranges:
    - Low elevation: Tehachapi, San Joaquin, and yellow-eared pocket mice (scrub and Joshua tree habitat); badger (grassland specialist, small carnivore, effected by roads, edges, and fragmentation); kit fox (found on Tejon Ranch)
    - Mid-elevation: Pacific kangaroo rat (scrub and chaparral, natural fire regimes)
    - Upper elevation: grey squirrel and chipmunk
    - Additional: dusky-footed woodrat (dispersal limited in scrub and chaparral habitats); Tulare grasshopper mouse (carnivorous, wide-ranging, rare); pocket gopher (manipulates vernal pool soils; often poisoned near agricultural lands)
- Plans for bat roosting habitat can be incorporated into bridge and overpass structures
- Linkages should provide live-in habitat for small mammal prey base, except where goal is simply to move wildlife across and away from roads; consider location of rare and endemic species to compliment linkage design (protect key habitats within linkage area)
- With climate change, expect upslope migration; linkages should be broad enough to accommodate natural processes (flood scour and deposition, fire, etc.); capture complete environmental gradients to protect multiple specialized species

Paul Beier, Northern Arizona University – *Cougars, Corridors, and Conservation*

Summary: Because the puma or cougar lives at low density and requires large habitat areas, it is an appropriate umbrella species for landscape connectivity in the South Coast Ecoregion. A crucial issue, however, is whether connectivity is provided by narrow corridors through urban areas (an artificial substitute for natural landscape connectivity). In particular,

corridors decrease extinction risk only if they facilitate dispersal of juveniles between mountain ranges. To address this issue, we conducted field work on pumas in the Santa Ana Mountain Range, a landscape containing 3 corridors (1.5, 6, and 8 km long). Each of the 3 corridors was used by 2 or more dispersing juvenile puma. Five of 9 radio-tagged dispersers successfully found and used a corridor. The corridors in this landscape were relict strips of habitat, not designed to facilitate animal movement. Puma doubtless would be even more likely to use well-designed linkages. Puma will use corridors that lie along natural travel routes, have < 1 dwelling unit per 50 acres, have ample woody cover, lack artificial outdoor lighting, and include an overpass or underpass integrated with roadside fencing at high-speed road crossings. "If we build it, they will come."

Biography: Paul Beier is Professor of Conservation Biology and Wildlife Ecology at Northern Arizona University. He has worked on how landscape pattern affects puma, northern goshawk, Mexican spotted owls, white-tailed deer, and passerine birds (the latter in both West Africa and northern Arizona). He serves on the Board of Governors for the Society for Conservation Biology. A full description of his activities is available at: http://www.for.nau.edu/~pb1.

- Pumas exist at low density; functional connectivity needed for movement and dispersal
- Santa Ana Mountains study: 9 radio-collared juvenile dispersers were tracked; three corridors / habitat constrictions present, but not designed for habitat connectivity:
  1. Coal Canyon (short freeway undercrossing near railroad tracks, stables, and golf course); 3 lions attempted to cross (2 successful); M6 was premier user of corridor, crossing under freeway more than 22 times in 18 months - home range included habitat on both sides of freeway; after completion of study, surrounding properties were preserved, and CalTrans agreed to close underpass to traffic, remove asphalt, and turn over to California State Parks for restoration and use as wildlife linkage
  2. Santa Ana – Palomar (longer, I-15 is major impediment, patchwork of land ownership); 2 lions attempted to cross (1 successful); one lion crossed Santa Ana – Palomar linkage by walking across I-15 rather than finding a safer route underneath; point of crossing was just north of border patrol / INS checkpoint; four un-tagged lions were killed crossing at this site – multiple lions are demonstrating preferred crossing site, which should be focus of planning for vegetated freeway overpass
  3. Arroyo Trabuco (protected from urban areas by tall bluffs, contains dense riparian vegetation, resident deer population, darkness, water); 3 lions attempted to cross (3 successful); lions spent 2-7 days traveling through this "comfortable" corridor
- Mountain lions do use narrow corridors and artificial linkages; 5 of 9 study animals found and successfully used at least one of the three corridors; these "accidental corridors" were not designed for animal movement, which explains some unsuccessful attempts

Claudia Luke, San Diego State University, Field Station Programs – *Considerations for Connectivity & Overview of Working Group Session*

Summary: This presentation describes the Santa Ana – Palomar Mountains linkage to allow workshop participants to understand purposes of focal species groups, identification of critical biological issues regarding connectivity, and qualities of species that may be particularly vulnerable to losses in connectivity.

Biography: Claudia Luke received her Ph.D. in Zoology from University of California, Berkeley in 1989. She is a Reserve Director of the Santa Margarita Ecological Reserve, an SDSU Field Station, and Adjunct Professor at San Diego State University. She is on the Board of Directors for the South Coast Wildlands Project and has been the lead over the last two years in conservation planning for the Santa Ana – Palomar Mountain linkage.

- At the statewide November 2000 Missing Linkages conference, participants determined which areas within California needed to be connected to allow species movement
- South Coast Ecoregion workgroup selected criteria to prioritize linkages and connect largest protected lands; planning efforts have progressed for the Santa Ana – Palomar Mountains linkage area, and workshops have been held to select focal species
- Global linkage role: preservation of biodiversity hotspot with concentration of endemic species (due to elevational gradients, soil diversity, convergence of ecoregions, etc.)
- Regional linkage role: maintenance of habitat connectivity to prevent extirpations, and considerations for climate change (warmer wetter winters and drier summers may cause extreme floods and wildfires; drier vegetation types may expand to higher elevations)
- Local linkage role: connect protected habitats, considering dispersal methods of focal species; consider impacts to habitat specialists, endemics, edge effects, and gene flow
- Focal species approach to functional linkage planning based on Beier and Loe 1992 corridor design (choose site and focal species, evaluate movement needs, design corridor, monitor); focal species are units of movement used to evaluate effectiveness of linkages; wide diversity of species necessary to maintain ecological fabric; collaborative planning effort based on biological foundation, and conservation design and delivery
- Choose species sensitive to fragmentation and disturbance to represent linkage areas; consider movement patterns, dispersal distances, barriers, impacts of non-native invasive species, commensal relationships (*Yucca whipplei* and its specific pollinator), and natural barriers for habitat specialists (elevational ranges, vegetation types, etc.)
- Each taxonomic working group will choose focal species, delineate movement needs, and record information on natural history, distribution, habitat suitability, current land conditions, and key areas for preservation and restoration; consider metapopulation dynamics so that if a species disappears due to disturbance, habitat can be re-colonized
- Taxonomically diverse focal species data will be displayed on conservation design map and used to guide planning efforts; information will be compiled into connectivity plan for linkages of South Coast Ecoregion; regional biology-based approach to linkages will help project to gain visibility and leverage to work with multiple agencies and organizations